5

INSTRUCTION MANUAL

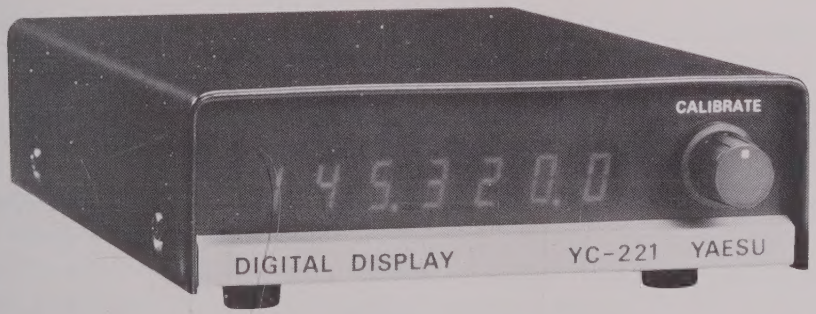
YC-221

YAESU MUSEN CO., LTD.

TOKYO JAPAN

YC-221 DIGITAL DISPLAY UNIT

FOR FT-221/221R 2-METER ALL MODE TRANSCEIVER



GENERAL

The model YC-221 Frequency Counter unit is designed to display the operating frequency on digital readout for the FT-221/221R 2-meter all mode transceiver.

The frequency is indicated in MHz, kHz, and 100 Hz ranges in seven digits displayed on LED (Light Emitting Diode).

The unit is connected to the transceiver by an attached cable and all necessary connections, such as the power supply, are included.

With the use of YC-221, the FT-221/221R transceiver will have both, digital and analogue, features.

SPECIFICATIONS

Frequency Display	-	144.0 MHz - 148 MHz
Digits	-	7 segment LED with MHz, kHz decimals
Gate Time	-	0.1 sec
Display Time	-	0.2 sec
Temperature	-	0°C - 40°C
Power Requirements	-	DC 13.5 Volt 0.5A supplied from the transceiver

SEMICONDUCTORS

ICs

MSM561	(2)
MSM5501	(1)
MSM5564	(1)
SN7400N	(1)
SN7404N	(1)
SN7490AN	(2)
SN76514N	(1)
SP8640B	(1)
μPC14305GP	(1)

LED

TLR-312	(7)

Transistors

2SC372Y	(5)
2SC509	(4)
2SC735Y	(1)
2SK19GR	(2)

Diodes

WZ-090	(1)
1S1555	(1)

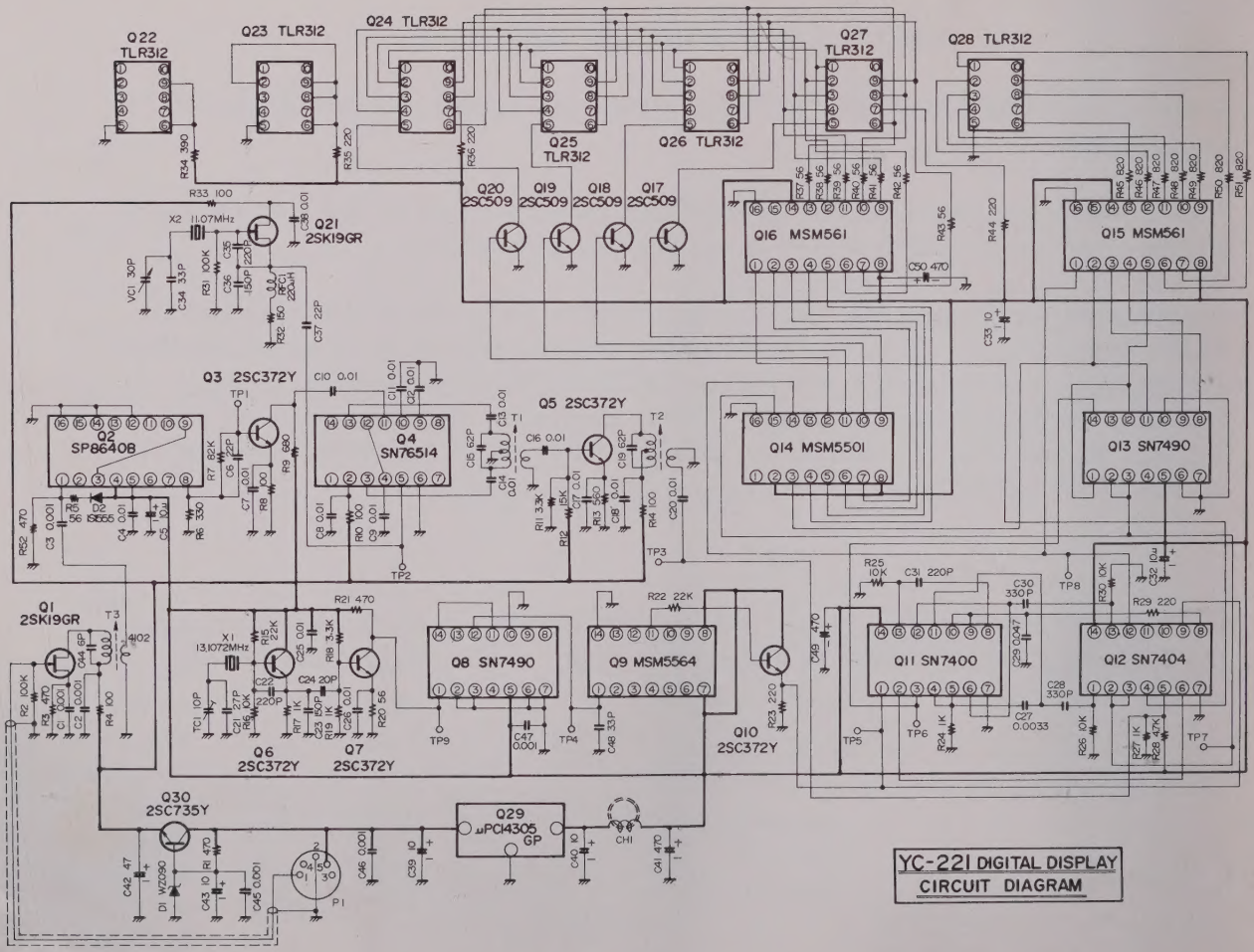
INSTALLATION AND OPERATION

Prior to installation of the YC-221, check the serial number of the transceiver.

The YC-221 can be installed without any modification to the transceivers which show a "D" mark followed by the serial number.

Connect the plug from the YC-221 to a DISPLAY jack on the rear panel of the transceiver. Calibrate the transceiver against an internal marker signal in accordance with the DIAL CALIBRATION paragraph of the transceiver instruction manual. Then, calibrate the frequency on the YC-221 to the correct frequency using a "CALIBRATE" potentiometer on the front panel of the YC-221.

For transceivers which do not show a "D" mark before the serial number, the following modification is necessary prior to connecting the YC-221 to the transceiver.



YC-221 DIGITAL DISPLAY
CIRCUIT DIAGRAM

CIRCUIT DESCRIPTION

The heterodyne signal of the transceiver mixer, 133.3 MHz - 137.3 MHz, is delivered through Pin 1 of the plug, P1, to the YC-221.

The signal is amplified by a buffer amplifier Q1, 2SK19GR and fed to the pre-scaler Q2, SP8640B where the signal is divided by ten.

The divided output signal is fed through a buffer amplifier Q3, 2SC372Y to the double balanced mixer, Q4, SN-76514N. The mixer produces 22.4 MHz - 24.8 MHz signal with a local signal of 11.07 MHz generated by crystal oscillator Q21, 2SK19GR. The heterodyned output is then amplified by Q5, 2SC372Y and fed to the frequency counter circuit.

The signal is then fed through an inverter Q12, SN7404N to gate circuit Q11, 7400N which passes the pulses while the gate opens. The pulses are sent to a decade counter Q13, SN7490AN.

The crystal oscillator Q6, 2SC372Y generates a 13.1072 MHz clock signal which is fed through a buffer amplifier Q7, 2SC372Y to a divider, Q8, SN7490AN, where the signal frequency is divided by ten.

The divided signal is then further divided by a binary counter Q9, MSM5564 to obtain 0.1 sec gate signal. The gate signal is fed through buffer amplifier Q10, 2SC372Y to the gate circuit Q11, 7400N.

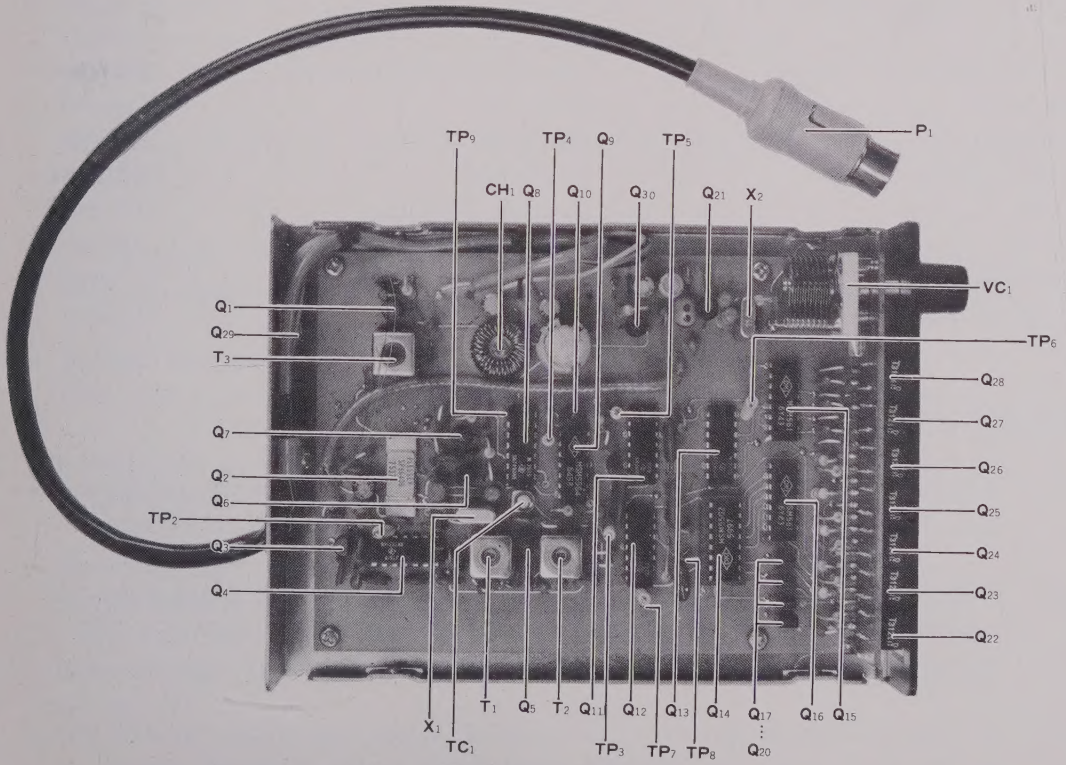
The pulses which passed through the gate circuit are fed to the decade counter Q13, SN7490AN which counts 10 Hz digits. The binary coded output signal from Q13 is fed to a decorder/driver/latch circuit Q15, MSM561 which drives display LED, Q28, TLR312.

The tenth pulse at Pin 11 of Q13, SN7490AN is fed to Q14, MSM5501 which counts 100 Hz, 1 kHz, 10 kHz and 100 kHz.

The BCD output signal from Q14 is fed through driver Q16, MSM561 to the display LED, Q24-27, TLR312.

Transistors Q17 - Q20, 2SC509 work as switches operated by a timing signal delivered from Q14 to select the output of Q16, MSM561. The output of Q16 drives display LED, Q24 - Q27 in a sequence of 1 kHz, 10 kHz, 100 kHz and 1 MHz. The LED Q23 and Q24 is set to display 1 and 4.

The DC voltage, 13.5V, supplied from the transceiver is stabilized at 5 volts by a voltage regulator Q29, μPB-249D GP for a digital integrated circuit. The 8 volts output from regulator Q30, 2SC735Y is used for other circuits.


P1
TP9
TP4
Q9
TP5
CH1
Q8
Q10
Q30
Q21
X2
VC1
TP6
Q1
Q29
T3
Q28
Q27
Q26
Q25
Q24
Q23
Q22
Q7
Q2
Q6
TP2
Q3
Q4
X1
TC1
T1
Q5
T2
Q11
Q12
Q13
Q14
Q17
Q20
Q16
Q15
TP3
TP7
TP8

MODIFICATION

PARTS REQUIRED:

Buffer Printed Board	PB-1671 Completed	(1 pce)
Spacers	M3 x 18	(2 pcs)
Screws	M3 x 8	(2 pcs)
Coax Cable	1.5D 2V	(18 cm)
Wire	0.18 x 7 White	(10 cm)
Wire	0.18 x 7 White/Brown	(12 cm)
Insulator		(1 pce)
Display Label		(1 pce)

MODIFICATION:

(1) Remove the bottom cover from the cabinet. Figure 1 shows the location of the modification work within the dotted circles.

(2) Remove the nuts holding J14 and J15 and replace them with the tapped spacers as illustrated. Be careful not to damage the wires when the spacers are tightened.

(3) Solder the white wire to Pin 17 of J15 and the white/brown wire to Pin 4 of J14. Solder the other ends to the printed board PB-1671 and install the printed board as illustrated in Figure 2.

(4) Locate the TONE IN jack, J2, on the rear panel. Remove the white wire from Pin 3 of J2 and Pin 4 of J17. Refer to Figure 3. Also remove the yellow wire from Pin 1 of J2 and Pin 8 of J17. Unsolder the white/green wire from Pin 4 of J2 and solder this wire to Pin 8 of J17.

(5) Remove the grey shielded wire from Pin 2 of J2 and Pin 33 (17A) of J22.

(6) Connect Pin E of J2 to the ground terminal between J17 and J18 with the yellow wire removed after step (4). Solder both ends.

(7) Solder the inner conductor of the coax cable supplied to Pin 1 of J2 and its outer conductor (shield) to Pin E of J2.

(8) Solder the coax cable, white and white/brown wires to the printed board PB-1671 as illustrated in Figure 3.

(9) Glue the insulator board to the inside surface of the bottom cover where the installed printed board PB-1671 will touch.

(10) Adhere the "DISPLAY" seal to the rear panel at the TONE IN mark.

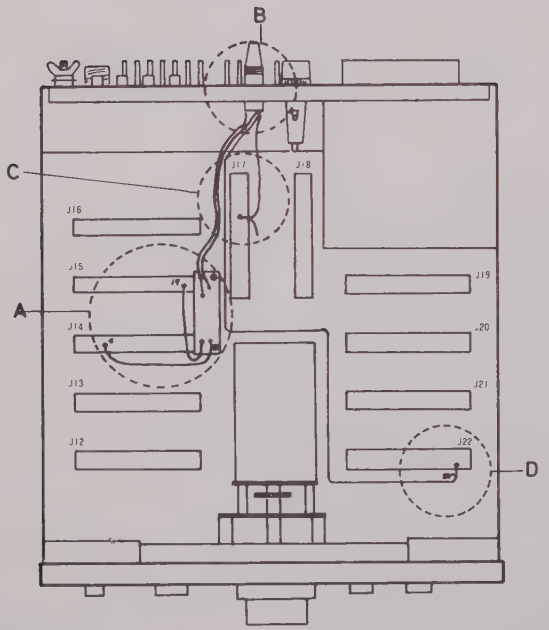

B
C
A
D
J16
J15
J14
J13
J12
J17
J18
J19
J20
J21
J22

Fig. 1

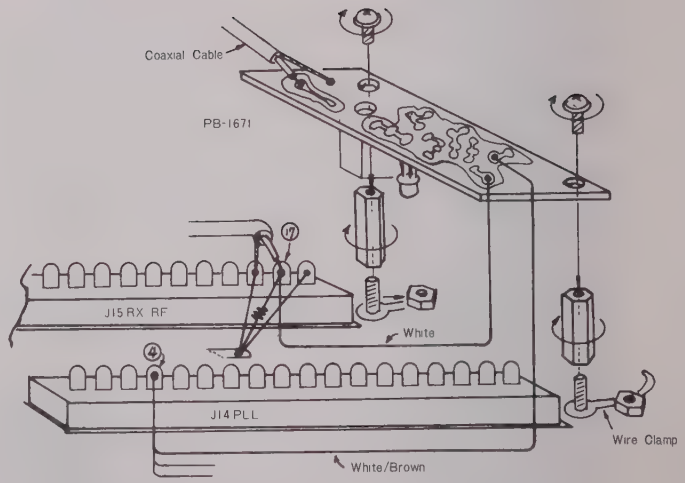

Coaxial Cable
PB-1671
J15 RX RF
J14 PLL
White
White/Brown
Wire Clamp

Fig. 2

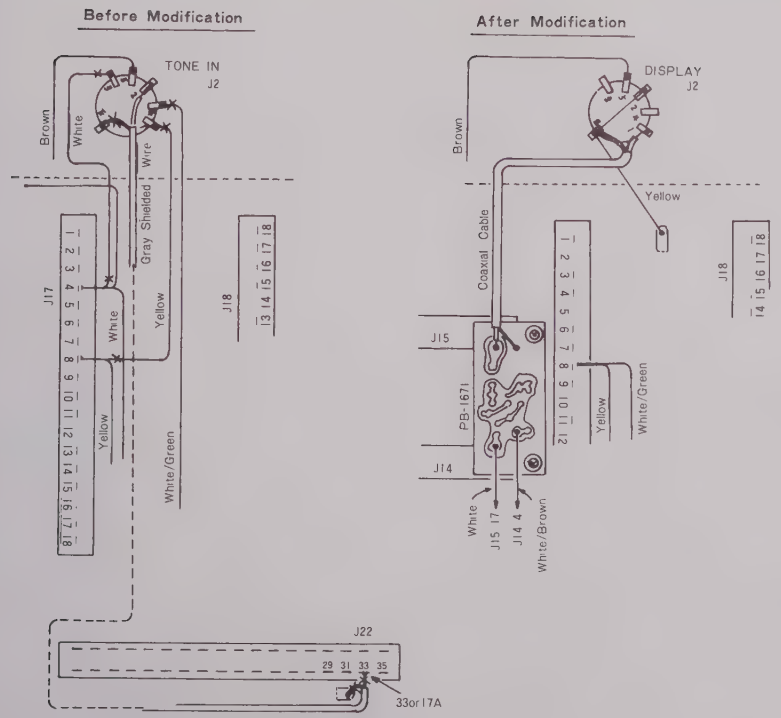
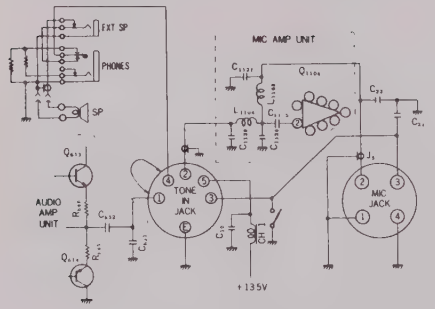

Before Modification
TONE IN
J2
Brown
White
Wire
Gray Shielded
J17
J18
White
Yellow
Yellow
White/Green
J22
29 31 33 35
33or17A
After Modification
DISPLAY
J2
Brown
Yellow
Coaxial Cable
J18
J15
PB-1671
J14
Yellow
White/Green
White
J15 17
J14 4
White/Brown

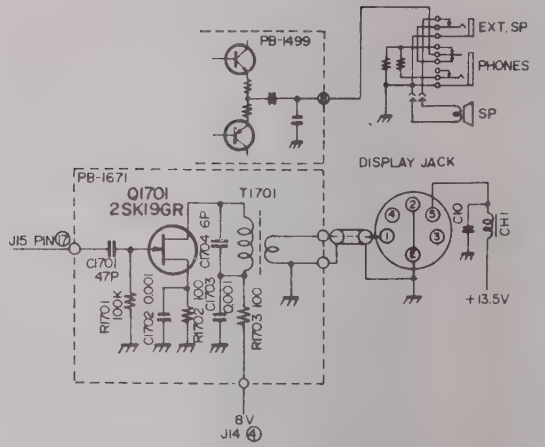
Fig. 3

Before Modification

TONE IN & MIC JACK
CIRCUIT



After Modification



PB	PRINTED CIRCUIT BOARD		
1616A	COUNTER BOARD		
1615A	DISPLAY BOARD		
Q	IC, FET, TRASISTOR		
15, 16	IC	MSM561	
14		MSM5501	
9		MSM5564	
11		SN7400N	
12		SN7404N	
8, 13		SN7490AN	
4		SN76514N	
2		SP8640B	
29		μPC14305GP	
1,21	FET	2SK19GR	
3, 5, 6, 7, 10	Tr	2SC372Y	
17～20		2SC509Y	
30		2SC735Y	
22～28	DISPLAY	TLR312	
D	DIODE		
1	Zener	WZ050	
2	Si.	1S1555	
X	CRYSTAL		
1	HC-18/U	13.1072MHz	#210034
2	HC-18/U	11.07MHz	#210033
R	RESISTOR		
	CARBON FILM		
5, 20		1/4W	56Ω
4, 8, 10, 14, 33		1/4W	100Ω
32		1/4W	150Ω
23, 29		1/4W	220Ω
6		1/4W	330Ω
1, 3, 21, 52		1/4W	470Ω
13		1/4W	560Ω
9		1/4W	680Ω
17, 19, 24, 27		1/4W	1KΩ
11, 18		1/4W	3.3KΩ
28		1/4W	4.7KΩ
16,25, 26, 30		1/4W	10KΩ
12		1/4W	15KΩ
15, 22		1/4W	22KΩ
7		1/4W	82KΩ
2, 31		1/4W	100KΩ
	CARBON COMPOSITION		
37～43		1/8W	56Ω
35, 36, 44		1/8W	220Ω
34		1/8W	390Ω
45～51		1/8W	820Ω
C	CAPACITOR		
	DIPPED MICA		
31		50WV	220PF
28, 30		50WV	330PF
	CERAMIC DISC		
44		50WV	6PF
24		50WV	20PF
6, 37		50WV	22PF
21		50WV	27PF
48		50WV	33PF
34		50WV	33PF(CH)
15, 19		50WV	62PF
1～3, 45～47		50WV	0.001μF
4, 7～14, 16～18		50WV	0.01μF
20, 25, 26, 38			

STYROL			
23, 36		50WV	150PF
22, 35		50WV	220PF
	MYLAR		
27		50WV	0.0033μF
29		50WV	0.047μF
	ELECTROLYTIC		
5, 32, 33, 39, 40, 43		16WV	10μF
42		10WV	47μF
41, 49, 50,		16WV	470μF
TC	TRIMMER CAPACITOR		
1	ECV-1ZW	10×50	10PF
VC	VARIABLE CAPACITOR		
1	150S		30PF
RFC	MICRO INDUCTOR		
1			220μH
T	TRANSFORMER		
1, 2			#220070
3	R12-4102		#220111
CH	NOISE SUPPRESSOR COIL		
1	SN-8S-50		
P	DIN PLUG		
1	TCP-0084		

FT-221 COUNTER BUFFER UNIT		
PB-1671	BUFFER BOARD	
Q	FET	
1701		2SK19GR
R	RESISTOR	
	CARBON FILM	
1702, 1703	¼W	100Ω
1701	¼W	100KΩ
C	CAPACITOR	
	CERAMIC DISC	
1704	50WV	6PF
1701	50WV	47PF
1702, 1703	50WV	0.001μF
T	TRANSFORMER	
1701	R12-4102	#220111

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